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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/029,103	12/21/2001	Sooyeul Lee	51876P282	3372

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EXAMINER

MACKOWEY, ANTHONY M

ART UNIT

PAPER NUMBER

2623

DATE MAILED: 01/21/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/029,103

Applicant(s)

LEE ET AL.

Examiner

Anthony Mackowey

Art Unit

2623

— The MAILING DATE of this communication appears on the cover sheet with the correspondence address —

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 12/21/2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 13 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-5, 12 and 13 is/are rejected.
- 7) ☒ Claim(s) 6-11 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 12/21/2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>12/21/2001</u> . | 6) <input type="checkbox"/> Other: _____  |

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1,2 and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 5,602,935 to Yoshida et al. (Yoshida).

As to claim 1, Yoshida discloses a method for measuring a bone mineral density, by use of an x-ray image, in a bone mineral density system (col. 3, lines 45-51, Yoshida teaches a method capable of accurately measuring a sample bone even if the bone has a complicated BMD (bone mineral density) pattern as well as an apparatus for carrying out the method) comprising the steps of:

(a) obtaining an x-ray image of bone (col. 16, lines 34-47, Yoshida teaches the x-ray information is recorded on an imaging plate, irradiated with a laser, detected by an optical detector and subjected to A/D conversion to obtain an x-ray image),

(b) setting a region of interest on the obtained x-ray image of bone (col. 16, lines 59-65, Yoshida determines a region of interest in an input image by a predetermined method),

(c) calculating a background trend due to soft tissues, at a bone portion within the set region of interest (col. 24, lines 31-33, Yoshida teaches the pattern of the soft tissues is approximated by the line interconnecting the two boundary points is used for correcting the

Art Unit: 2623

influence of the soft tissue. This influence of soft tissue is understood to be the background trend); and

(d) calculating an index of the bone mineral density by removing the background trend due to the soft tissues, at the bone portion within the set region of interest (col. 24, lines 33-37, 50-52, Yoshida teaches the pattern of the soft tissue pattern is subtracted to obtain a corrected pattern for the bone proper and that bone mineral density is determined using the corrected pattern).

As to claim 2, Yoshida discloses all the limitations of the method recited in claim 1 and wherein the region of interest, containing the soft tissue portions at a left and right of the bone portion, is set in the obtained x-ray image of bone (Figs. 25 and 26, The graphs are clearly labeled indicating soft tissues to the left and right of the bone positions).

As to claim 12, Yoshida further discloses a computer readable recording medium storing instructions to implement a method for measuring bone mineral density (col. 14, lines 42-44, Yoshida teaches a computer means comprising a ROM storing processing programs, and a RAM for arithmetic operation and temporary data storage.). As to the remainder of the claim, arguments analogous to those presented in claim 1 above are applicable to claim 12.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 3-5 and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of U.S. Patent 5,602,935 to Yoshida et al. (Yoshida) and U.S. Patent 6,671,394 to Sako.

As to claim 3, Yoshida discloses all the limitations of the method recited in claim 1 and further includes the steps of:

(c1) selecting a fitting function to calculate the background trend of the bone portion (col. 24, lines 31-45, Yoshida teaches a curved or straight line interconnecting the two boundary points between the soft tissue and bone selected based on the distribution of the thickness of soft tissue.), and

(c2) setting the background trend by interpolating the profiles of the soft tissue portions adjacent to the bone portion into the bone portion by the selected fitting function (col. 24, lines 31-33, Fig. 28B, Yoshida teaches the line connects the boundary points, thus the profile of the soft tissue is interpolated into the bone portion. This can be seen clearly as being represented by the labeled "curved line" Fig. 28B.).

Yoshida discloses photoelectric information read from the imaging plate is subjected to A/D conversion to obtain an x-ray image of the bone and the image is processed for bone measurement (col. 16, lines 43-47), however, Yoshida is silent with regard to the soft tissue being presented in gray-level profiles. Sako discloses a method in which an x-ray image undergoes gradation gray scale conversion processing (col. 16, lines 62-63; col. 13, line 64 – col. 14, line 2, The gradation process adjusts the gray scale values of the image in order for the image to resemble an x-ray film image.).

The teachings of Yoshida and Sako are combinable because they are in the same field of endeavor, processing of x-ray information in the form of digital x-ray images. It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teachings of Yoshida and Sako, having the method taught by Yoshida be performed on gray-level images as taught by Sako. One skilled in the art would have been motivated to do so because a gray-level image's gradation characteristics are similar to the x-ray film (silver salt film) generally used to view x-ray images. Doctors have been well trained in diagnosing patients using this visualization technique and thus the doctors would be able to apply the same techniques to the digital images without the need to output the x-ray image to film or develop new diagnostic techniques (Sako, col. 13, lines 33-54).

As to claim 4, the combination of Yoshida and Sako discloses all the limitations of the method as recited in claim 3, Yoshida further includes the steps of:

(c2-b) dividing the obtained profile into the bone portion and the soft tissue portions (col. 24, lines 16-3, The boundary points selected by Yoshida divide the image into bone and soft tissue portions.); and

(c2-c) interpolating the profile of the divided soft tissue portions into the bone portion by the fitting function and setting an interpolation result to the background trend due to the soft tissues (col. 24, lines 31-45, Fig. 28B, Yoshida teaches a curved or straight line interconnecting the two boundary points between the soft tissue and bone selected based on the distribution of the thickness of soft tissue; the line connects the boundary points, thus the profile of the soft tissue is interpolated into the bone portion. This can be seen clearly as being represented by the labeled "curved line" Fig. 28B

Yoshida discloses photoelectric information read from the imaging plate is subjected to A/D conversion to obtain an x-ray image of the bone and the image is processed for bone measurement (col. 16, lines 43-47), however, Yoshida is silent with regard to obtaining the gray level profile from the region of interest. Sako discloses a method in which an x-ray image undergoes gradation gray scale conversion processing (col. 16, lines 62-63; col. 13, line 64 – col. 14, line 2, The gradation process adjusts the gray scale values of the image in order for the image to resemble an x-ray film image.). Arguments presented in claim 3 with regard to the combinability of Yoshida and Sako, and motivation for doing so, are applicable to claim 4.

As to claim 5, Yoshida further discloses the fitting function is a polynomial of a 4<sup>th</sup> order or less (col. 24, lines 37-41, Yoshida teaches that the line may be straight or curved. For a line to be curved it must be at least a 2<sup>nd</sup> order polynomial, thus the teachings of Yoshida would include lines formed by polynomials of 4<sup>th</sup> order or less.).

As to claim 13, arguments analogous to those presented in claim 3 above are applicable to claim 13.

***Allowable Subject Matter***

Claims 6-11 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent 6,205,348 to Giger et al. is cited for teaching a computerized method and system for the radiographic analysis of bone structure, which includes bone mineral density.

U.S. Patent Application Publication 2002/0196966 by Jiang et al. is cited for teaching measuring bone mineral density based on digital images.

U.S. Patent 6,763,257 to Rosholm is cited for teaching a method of estimating the bone mineral density of a bone using radiogrammetry.

U.S. Patent 6,324,252 to Siffert et al. is cited for teaching a method of bone densitometry in which x-ray film images are digitally scanned and processed.

U.S. Patent 5,633,511 to Lee et al. is cited for teaching a method of automatically adjusting the tone scale for digital radiographic images.

U.S. Patent 6,370,265 to Bell et al. is cited for teaching a method generating a gray scale image having desired contrast and brightness to represent a radiographic image.



**Contact Information**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Anthony Mackowey whose telephone number is (703) 306-4086. The examiner can normally be reached on M-F 8:30-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amelia Au can be reached on (703) 308-6604. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AM  
1/6/2005

  
Jon Chang  
Primary Examiner